

LOW VOLTAGE ELECTRON SOURCE WITH SELF ALIGNED GATE APERTURES, FABRI- CATION METHOD THEREOF, AND LUMI- NOUS DISPLAY USING THE ELECTRON SOURCE

Abstract

An electron source include a first cathode electrode disposed over a substrate and terminated to provide electrons; an emitter layer disposed over the cathode electrode and formed from one or plurality vertically aligned and mono-dispersed nano-structures that are truncated to the same length, embedded in a solid matrix and protruding above the surface for emitting electrons; an insulator disposed over the emitter layer and having one or plurality of apertures, each is self-aligned with and exposes one nano-structure in the emitter layer; and a second gate electrode disposed over the insulator, having one or plurality of apertures self-aligned with the apertures in the insulator and terminated to extract electrons from the exposed nano-structures through the apertures. The gate aperture is substantially less than one mi-

crometer and the gated nano-structures can have a density on the order of $10^8/\text{cm}^2$. Such an electron source can be modulated with an extra low voltage, emits electrons with high current density and high uniformity, and operates with high energy-efficiency and long lifetime.